



AGRO-TECHNOLOGIES, EMPOWERMENT AND SUSTAINABILITY OF TRADITIONAL COMMUNITIES IN BRAZILIAN AMAZON

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ABSTRACT

The objective of this work was describe the technological extension projects characterized by introduction of new agro-technologies in an integrated way (university-farmers) in the context of agriculture and fishing family systems in floodplains environments. The methodology characterized for interdisciplinary and participate research on Peruvian and Brazilian flooding forests with traditional communities on Amazon biome. The results showed an increase of agro technological level in both communities on Brazil and Peru and consequently, better economy. The conclusions show that a perspective beyond the social, economic and environmental aspects should characterize thinking environment in the Brazilian Amazon of the 21st century. Introduce the agro-technology-empowerment binomial as a bioindicador and therefore transformation's instrument, modernization and inclusion of Amazonian communities in scenarios of solidarity economy, is to value productive evolution of these peoples, creating harmonic scenarios between environment and rural societies.

INTRODUCTION:

The Amazon Biome characterized not only by high biological diversity, but also by a socio-cultural diversity that determines the use of natural resources and products generated. Under the territorial aspect, the Legal Amazon initially created as an area of activity of the Superintendence of the Amazonian Economic Recovery Plan (1953). It currently corresponds to the area of States of North Region (Acre, Amapá, Amazonas, Pará, Rondônia, Roraima and Tocantins), plus the State of Mato Grosso and the municipalities of the State of Maranhão, located west of the 44° O meridian. Territorial diversity is also repeated with respect to vegetation and soil, resulting in a complex mosaic of different phytophysionomies and contexts which are used by the different ethnic groups, races and migrants of other regions of the country (mainly northeast and south), which are classified by the IBGE (2015). This typification through rural regions is a historical demand of the different social actors in the Amazon, as a pressing need to zonate the territory with the purpose of valorizing and strengthening the relation with space (Becker, 1999). Considering that rural regions in Brazil differentiated from each other based on soils, vegetation, agricultural aptitude, economic flow and culture among the main criteria, then it is natural that this diversity is high. However, if we included the agro-technological level as a parameter of differentiation, we would then have a homogenization rural process in a maximum of two to three classes, with intermediate and low agro-technological level. Where the highest agro-technological levels were found in the regions of southern and southeastern Brazil and the lowest in the north-eastern and northern regions, the latter in a more critical situation. Agrotechnologies are processes developed to be able to optimize the cultivation of agricultural plants of socioeconomic interest and reduce the risks of stresses caused by water, nutrients, pests and diseases, resulting in high crop productivity and mitigation of environmental impacts caused by agriculture or fish farming. In the Amazon, the agro-technological level in family farming scenarios is low, since most agriculture and rural settlements still practice an agriculture where the area's preparation still based on the use of fire on vegetation or using a hoe to Clean up the cultural remains. Only some rural properties that have tractor and grids aradoras or fertilizers seeders, characterizing then the technological gap. As Bertha Becker said, "...to produce to preserve in the Amazon." this expression is still pertinent and contemporary when we think for example that man is part of that environment and therefore must produce to sub exist and exist. However, how to produce without technology? How to make the productive inclusion of traditional groups in the Amazon without modernized their production's modes? Modernizing agro-technologies, here, must understood as respect for the evolutionary process of these rural groups, which like any other group, urban for example, have the right to evolve. In this way, we introduce here the first reflection on the importance of agrotechnologies for the productive development of family farmers and extrativists in the Brazilian Amazon. Our working hypothesis is that by empowering them through agro-technologies it is possible to obtain in a more rapid way the socio-economic and environmental sustainability necessary for the local and regional development of Amazonian societies. This hypothesis is a counterpoint to the rural policy implemented in Brazil in the last decade. The actual agrarian politics approach between 2005 and 2014 in Brazil was based on scholarship programs such as for Family, Green, for fisheries, among others, which had an urgent objective of recovering the historical debt to peasants. However, this fact configuring over time as a welfare worker, at moment when it did not offer agro-technologies capable of improving the production and processing methods of products from agriculture and family fishing. Artisanal fishermen in the Amazon are experiencing the catastrophic result of this assistance public policy today. They have already lost their "insurance" (a purse given to the fisherman during 4 months of reproduction of certain species of fish so that he does not fish them) due to serious economic crisis that

Brazil is experiencing. The grants and insurances are temporary, and they were indeed. However, what is the economic sustainability option given by the State to small farmers or extrativists in the Amazon in last decade? The temporality of scholarships is opposed to the permanent nature of agro-technologies, while the former proved to be an unsustainable instrument, and latter can become a sustainable instrument.

However, it can see that the level of empowerment of agrotechnologies by farmers and extrativists is decisive in the sustainability of production processes created in agroecosystems in the Amazon Biome. Empowerment here can understood as a process in which the subject (agroextrativists) master the techniques introduced and believe in such agro-technologies for better development of their activities. In this context, we present here a second reflection on the interdependence between agro-technological sustainability & empowerment. Such interdependence, if it is strong, will lead to sustainability of the open and complex system in question, in this case agro-systems, and if this interdependence is weak, then the unsustainability or disintegration of this system will occur, such results are due to the self-organization of a (Amazonic agroecosystems), which is unpredictable in time and not linear (Prigogine 1984). Perhaps here, we have a critical point to be resolved, once, that many projects are unsuccessful because of the fragile empowerment that develops at some point in this process of agro-technological innovation. In this context, the Amazon as a frontier of natural capital (Becker, 2005) when it dialogues with the issue of empowerment by traditional communities on agro-technologies, may result in a relationship of political autonomy of these peoples regarding the use of bio geodiversity resources. Thus, the objective of this work was describe the technological extension projects characterized by introduction of new agro-technologies in an integrated way (university-farmers) in the context of agriculture and fishing family in the Lower Amazon Territory. This work may be able to contribute to agroextrativists inclusion production in ecological economic scenarios in the Amazon and thus build over time a path towards sustainability.

METHODOLOGIES:

The two projects were actions of the Laboratory of Studies of Amazonian Ecosystems (LEEAA), of Institute of Biodiversity and Forests (IBEF) of the Federal University of Western Pará (UFOPA), a university located to the west of Pará state-Brazil. The projects have the following characteristics:

Project I: Technological Center in Horticulture in the Tapajós-Amazonia region. This project developed in three municipalities, Belterra, Mojui dos Campos and Santarém; and aimed to bring new agrotechnologies not yet tried in the region. These agrotechnologies were: 1 - Agricultural mechanization of family agroecosystems; 2. Introduction of Tunnels and Growing Greenhouses; 3. Introduction of irrigation systems; 4. Introduction of the crop on mulching (cultivation on double-sided plastic film); 5. Introduction of seedlings in vitro production Technology; 6. Introduction of fruit pulp beneficiation. This project funded by the Secretariat of Regional Development of the Ministry of National Integration of the Brazilian federal government. The management of the project took place through the creation of three management subgroups, one in each municipality and one main management group, where the representatives of the three subgroups and the team of extensionists-researchers from the University would meet and deliberate periodically. The implementation of the Technological Center on Tropical Horticulture in the region of Tapajós is the result of a historical demand in the region for new technologies in agriculture, both in the modes of production and in the ways of processing vegetables and fruits. The current vegetable production scenarios in the Tapajós region demonstrate the high potential

of this region for vegetable agroindustry, however, the low technological level of production and the absence of minimum processing of these products hinders the productive inclusion of farmers in local and regional markets.

Project II: Sustainable Management of Brazilian and Peruvian floodplains. This project developed in five pilot várzeas, being three in Brazil and two in Peru. The study sites in Brazil corresponded to the communities of Tapará Grande and Igarapé do Costa, 2 ° 24'52 " S and 54 ° 42'36 " ; Both bathed by the Amazon River in the municipality of Santarém, while in Peru, the wetlands worked were San Jacinto and San Regis in the Nauta's Region (UTM E 0623314 and N 9495909), Loreto, Iquitos. This project aimed to introduce the following agrotechnologies: 1. High gardens with hydroponic systems in Brazilian floodplain agroecosystems 2. Tanks fish farming in Brazilian and Peruvian floodplains; 3. Mechanization of craft activity in Peruvian floodplains. Project management took place between the cooperation of the faculty teams between the Federal University of the West of Pará (UFOPA), which coordinated the project through LEEA and the Peruvian Scientific University (UCP). The justification for realization of this project is the historical demand of artisanal, fishermen and farmers of floodplain environments for technologies that intensify the production of fish, vegetables and handicrafts due to the drought and flood dynamics of the Amazon River. The water column difference between these periods is on five meters. Such fluctuation over the years has caused the floodplain environment and increase of resilience communities to local climatic changes such as severe floods and prolonged periods of drought, under the influence of phenomena such as El Niño and El Niña. The Global Environmental Facilities (GEF), UNEP and ACTO (Amazon Cooperation Treaty Organization) funded the project.

RESULTS:

Project I: The results obtained in the Technological Center in Hortifruticulture in the region of Tapajós were:

1. In the demonstrative sites the transition from manual preparation area by to mechanization way, resulting in an increase of production, seed economy, planting optimization, increase of income and improvement of the ergonomic work conditions; 2. In the demonstration sites where the greenhouses installed, the production of these crops increased mainly during the rainy season, where the reduction of the impact of the rains on plants was essential for productivity increase; 3. The introduction of the irrigated systems in ten hectares, allowed the survival of the vegetables and fruit trees planted in the face of extreme drought event in 2015, since water stress was avoided once again with the use of agro-technology, that is, irrigation; 4. Introduction of mulching techniques at the pilot sites resulted in an increase in the production of vegetables (lettuce, cabbage, green scent, spring onion and melon), due to the increase in the availability of water, nutrient economy and elimination of pesticides and herbicides uses; 5. The introduction of in vitro production of economic interest seedlings is still in the initial process, will result in the cost savings by the farmers that currently buy from other regions of Brazil, in addition to the scale production of Clones of high genetic standard; 6. The introduction of the plant for the processing of fruit pulp still in the installation phase will result in the verticalization of fruit production, once sold in natural conditions, culminating in the increase of the cooperative's income and diversification of production.

Project II: The results obtained in the project Sustainable Management of Brazilian and Peruvian floodplains were 1. The installation of two raised gardens with a hydroponic system to grow vegetables in Brazilian floodplain ecosystems resulted in the continuity of riparian productive process. Even during the agro-technology introduced was designed for this time of water stress (flood of agricultural areas), allowing the várzea farmers to continue cultivating even in the flood of the Amazon River and thus to try to reduce the economic impacts that this period brings to communities; 2. The introduction of tanks for tambaqui fish farming in both Peruvian and Brazilian floodplains resulted in intensification of fish production. Also, elimination the effect of prohibited fishing season, that is, fishermen once artisanal and now also fish farmers could sell tambaqui in this period (natural reproduction period), since they came from cultivation in tanks nets, which the artisanal fishermen could not do, because they could not fish this species in the reproduction time; 3. Mechanization of handicrafts in the community of San Jacinto in Peruvian floodplain agroecosystems resulted in improved ergonomic conditions for craftsmanship and optimization of artisan's time, since it took up to one day to sanding a wooden dish, while with the electric sander the time has been reduced drastically, allowing the productive inclusion of this artisan in local and regional markets.

Although the Amazon is still on the margins of Brazilian state (Becker, 2013), it should be noted that national or international projects that are carried out with the aim of contributing to the development of traditional communities are punctual and do not reach the entire system, in the case, The Amazonian territory. Associated with the fact, that the approach is usually conservationist and undeveloped; we can, through the results of technological extension brought here, believe that Amazonian agro systems as open and complex systems. This system begin to self (re) organize when they incorporate new agrotechnologies in their traditional modes of production as a strategy of resilience and reduction of socioeconomic chaos already experienced by Amazonian populations.

Considering the concept of resilient economy (Briguglio et al, 2008) and the capacity of cities and societies to recover from external economic / ecological shocks resulting in stable contexts of social development and efficient microeconomics, then in the Amazon we are experiencing moments of low economic resilience especially in rural settings. An example of this was the severe drought that occurred in Santarém city in western Pará state, Brazil in 2015, when there were 160 without rainy days. That developed a serious economic damage to agroextractivists and farmers in the region, who had no technology in the case, irrigation, lost all their production culminating in their productive exclusion from the local markets. Conclusions. A perspective beyond the social, economic and environmental aspects should characterize thinking environment in the Brazilian Amazon of the 21st century. Introduce the agro-technology-empowerment binomial as a bioindicador and therefore transformation's instrument, modernization and inclusion of Amazonian communities in scenarios of solidarity economy, is to value the productive evolution of these peoples, creating harmonic scenarios between environment and rural societies.

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